Prevalence of Third Molars and Pathological Changes Related to Them in Dental Medicine

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ABSTRACT

The purpose of this study was to determine the prevalence of third molars in terms of respondents' age. Furthermore it was desired to determine the extent of the manifestation of pathological changes, such as caries, apical lesions, and alveolar bone resorption. This study was based on 500 OPGs of patients from the Faculty of Dentistry, University of Zagreb. Patients were divided into seven age groups. The total number of molars, the number of cavities on remaining molars, the quality of endodontic treatment and the evaluation of their performance and presence of periapical lesions was analyzed. As a part of the periodontal status, the number of inadequate fillings, the number of damaged furcations and bone resorption was analyzed. The statistical analysis was performed by means of STATISTICA 7 statistical package (StatSoft, Tulsa, USA). The correlation between the total number of molars and the age of patients was analyzed by means of Spearman's correlation to the level of significance of 0.05. The number of first, second and third molars significantly decreased in higher age groups. The prevalence of caries in third molars as compared to first and second molars was generally lower, third molars were endodontic treated at least. Assessment of involved furcations showed that the lowest percentage of 8% was found in third molars. The majority of all remaining molars had bone resorption of 1–3 mm.

***Key words**: third molars,prevalence, caries, endodontic treatment, periodontal status*

Introduction

In modern people third molars have the highest frequency of polymorphism, malposition in the dental arches, impaction and agenesis[1,2]. This can be explained by the fact that third molars are the only teeth that develop entirely after birth. All other teeth begin development in utero or as in case of permanent second molars are entering into tooth bud stage of development near birth. The initiation of the development of third molars does not begin until ectodermal dental lamina, migrating distally in the growing child's mouth, spatially relates to and interacts with jaw mesenchyma which is derived from embryonic cranial neural crest. If this two tissues never interact, no tooth will form[3].

One common and widely accepted explanation of tooth evolution contends that molars evolved when humanity's ancestors roamed the earth on four legs more than 100 million years ago[4]. The position of head on the spinal column was rotated backward placing their jaws and teeth forward in prime position for use. Teeth were vital survival tool used in catching, killing and eating uncooked prey; confronting and fighting enemies; and gathering, manipulating and chewing food. Evolution likely favored the development of large third molars and the added chewing surfaces they provided when jaws were large and there was a survival advantage to possessing teeth.

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The dependency on teeth for survival began to decrease several million years ago when hominids assumed an upright posture[5]. The discovery of fire and the creation of cooking utensils allowed to boil and soften their food ensuring humanity's survival even if people possessed no teeth at all. As a result of these dramatic biological and cultural evolutionary changes people have experienced a decrease dependency on all tooth types, particularly third molars, over the ages.

Today despite advances in preventive dentistry the location of third molars in the dental arches often makes them difficult to care for and their frequent impaction exposes patients to degenerative conditions infrequently associated with any other tooth type which leads to more frequent use of drugs such as nonsteroid anti- inflammatory analgetics and corticosteroids[6,7].

Pericoronitis, caused by an incompletely sprouted wisdom tooth, creates problems like swelling and pain, halitosis and trismus, abscess lodge (pterigomandibular, parapharyngeal and retrofaringeal), which are all the accompanying complications of the wisdom-teeth growth--process[8–10]. Cysts and tumor formation are also common in the region of third molars (ramus and angle of the mandible)[11,12]. All of that can seriously effect on quality of life[13].

Some patients gain functional benefit from the restoration of third molars when, for example, third molar is used as an abutment for fixed or removable prosthesis when other more functional molars have been lost due to disease or trauma. The clinical value of third molars in some selected clinical situations, therefore, cannot and should not be overlooked.

Materials and Methods

The study included 500 orthopantomograms (OPG) of dental patients from the Department of Dental Pathology and the Department of Periodontology, School of Dental Medicine, University of Zagreb. The study encompassed patients aged over eighteen. Apart from age, another criterion for the classification of OPGs was patients' gender.

The DPRs were examined in order to determine:

1. Presence of caries – Presence of a caries damage to the tooth crown and root was recorded. As for caries on the crown, additional recording was carried out in order to determine whether it appeared in fissures or proximally.

2. Endodontic treatment – The purpose was to determine whether the tooth was endodontically treated or not. If the root canal treatment was done, we assessed whether it was done successfully. In case of failed endodontic treatment, we recorded whether root canals were too short- filled or overfilled.

3. Apical lesion – The aim was to determine the presence of apical lesion in the periapical area of teeth and whether they were endodontically treated.

4. Periodontal status – The presence of overhanging restorations and crowns was registered, as well as the presence or absence of furcation involvement. As far as bone resorption is concerned, it was divided in four groups: the first group included resorption under one millimeter, the second group included resorption ranging 1–3 mm, and the third group ranging from 3–6 mm, while the fourth group referred to resorption that exceeded six millimeters.

The OPGs were analyzed in order to determine the presence or absence of first, second and third molars, as well as possible pathological changes on them. The study was carried out on the basis of a questionnaire specially prepared for that purpose, in which we registered the obtained data for each OPG.

The statistical analysis was performed by means of STATISTICA 7 statistical package (StatSoft, Tulsa, USA). The following variables on the OPGs were analyzed: the presence of first, second and third molars, crown and root caries, periapical lesions, endodontic treatments, protruding restorations, damage bifurcation, and the depth of periodontal pockets at present molars. The variables were therefore categorized for this purpose. The correlation between the total number of molars and the age of patients was analyzed by means of Spearman's correlation to the level of significance of 0.05.

Results

A total of 500 OPRs belonging to patients aged 18–78 were examined. Patients were subsequently divided into seven age groups: the1st age group = OPGs of people aged under 20; the 2nd age group = OPGs of people aged 21–30; the 3rd age group = OPGs of people aged 31–40; the 4th age group = OPGs of people aged 41–50; the 5th age group = OPGs of people aged 51–60; the 6th age group = OPGs of people aged 61–70; and the 7th age group = OPGs of people aged over 70 (Figure 1).

Most OPGs referred to the fourth age group (22.6%), and least of all to the seventh age group (merely 2%) as shown in Table 1.

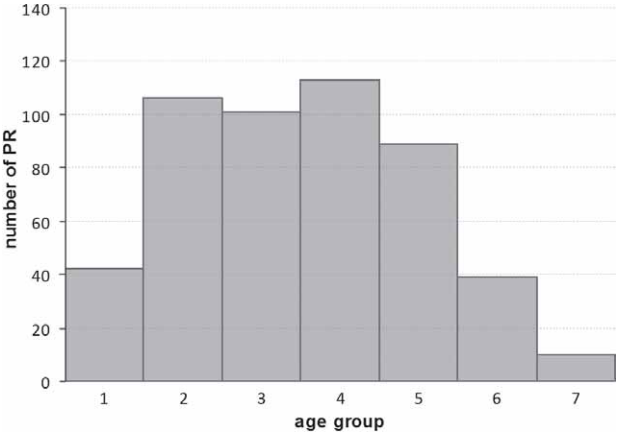

Fig. 1. Distribution by age groups.

TABLE 1
TABLE OF OPG DISTRIBUTION BY AGE GROUPS

Age group	Table of frequency (age group)		
	N	Σ	%
1	42	42	8.4
2	106	148	21.2
3	101	249	20.2
4	113	362	22.6
5	89	451	17.8
6	39	490	7.8
7	10	500	2.0

N – OPG number in different age groups

The total number of molars (first, second and third), number of cavities on the remaining molars, presence of periapical lesions and endodontic treatment was analyzed. Table 2 shows the median and the mode of the variables, where the mode refers to a variable that has emerged with the highest frequency.

It is visible from the table that the examined OPGs showed on average two remaining first and third molars, and four second molars.

The remaining first molars had average one caries, just like the remaining second molars. Although rarely, endodontic treatment and periapical lesions could also be seen on the remaining first and second molars. Third molars mostly had no caries, endodontic treatment or periapical lesions.

Since OPGs belonged to people of different age groups, it was to be expected that the distribution of the observed variables would differ with respect to age, as shown in table 3.

As it appears from the table, the average number of first and second molars decreased with age, while the average number of third molars was higher in the second than in the first age group.

OPGs analysis concerned the following variables: the presence of first, second and third molars, crown and root caries, apical lesions, endodontic treatment, protruding restoration, damage bifurcation, and alveolar bone resorption in molars present. The variables were for that purpose subsequently categorized. The distribution of observed variables in first molars is shown in Table 4. OPG analysis determined the lack of a total of 883 (44.15%) first molars. On the remaining first molars, the decay of the crown was usually present, i.e. on 354 teeth, which accounted for 31.69% of first molars present. Only 105 (9.40%) first molars had a successful endodontic treatment, while 121 of them (10.83%) had unacceptable root-fillings. One hundred and eighty-seven (16.74%) first molars had periapical lesions, and 417 of them (37.33%) had inadequate restoration. Furcation involvement was found in 482 (43.15%) cases. In the majority of remaining first molars, alveolar bone resorption was 1–3 mm (50.13%).

The distribution of observed variables in second molars is shown in Table 5.

OPG analysis determined the lack of a total of 416 (20.80%) second molars. On the remaining second molars the decay of the crown was present in (330 teeth), which accounted for 20.83% of present second molars. Eighty-six (5.43%) second molars had a successful endodontic treatment, while 80 (5.05%) of them had unacceptable root-fillings. Periapical lesions were found in 178 (11.24%) second molars, and 358 (22.60%) had inadequate restorations. Furcation involvement was found in 530 (33.46%) cases. In the majority of the remaining second molars, alveolar bone resorption was 1–3 mm (50.69%).

TABLE 2
DESCRIPTIVE STATISTICS FOR THE OVERALL NUMBER OF FIRST, SECOND AND THIRD MOLARS, THE NUMBER OF CARIES, ENDODONTIC TREATMENTS AND PERIAPICAL LESIONS (OPG ANALYSIS)

Variable	Descriptive statistics			
	N	Median	Mod	Mod freq.
Total number of first molars	500	2	4	135
Total number of caries on first molars	500	1	0	205
Total number of endodontic treatments on first molars	500	0	0	327
Total number of periapical lesions on first molars	500	0	0	344
Total number of second molars	500	4	4	269
Total number of caries on second molars	500	1	0	199
Total number of endodontic treatments on second molars	500	0	0	361
Total number of periapical lesions on second molars	500	0	0	355
Total number of third molars	500	2	0	155
Total number of caries on third molars	500	0	0	324
Total number of endodontic treatments on third molars	500	0	0	467
Total number of periapical lesions on third molars	500	0	0	454

N – number of OPGs

TABLE 3
THE PRESENCE OF MOLARS (OVERALL NUMBER, NUMBER OF DENTAL CARIES, ENDODONTIC TREATMENTS AND APICAL LESIONS – OPG ANALYSIS) IN TERMS OF AGE

	AG	1(N=42)	2 (N=106)	3 (N=101)	4 (N=113)	5 (N=89)	6 (N=39)	7 (N=10)
		median	median	median	median	median	median	median
First molars	Number	4	3	2	2	2	1	0
	K	1	1	1	1	0	0	0
	E	0	0	0	0	0	0	0
	P	0.5	0	0	0	0	0	0
Second molars	Number	4	4	4	3	3	3	2
	K	1	1	1	1	1	0	1
	E	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0
Third molars	Number	1	4	2	2	1	0	0
	K	0	0	0	0	0	0	0
	E	0	0	0	0	0	0	0
	P	0	0	0	0	0	0	0

AG – age group, N – number of OPGs in different age groups, C – overall number of caries, P – overall number of periapical lesion, E – overall number of endodontic treatments

TABLE 4
SHOWING THE DISTRIBUTION AND FREQUENCY OF THE EXAMINED VARIABLES IN FIRST MOLARS (THE PRESENCE OF FIRST MOLARS, DENTAL CARIES, ENDODONTIC TREATMENT, APICAL LESION, INADEQUATE RESTORATION, DAMAGE BIFURCATION, ALVEOLAR BONE RESORPTION

		Number of teeth	% In total	% Present
Missing	yes	883	44.15	
	no	1117	55.85	
Caries	crown	354	17.70	31.69
	root	77	3.85	6.89
	crown and root	35	1.75	3.13
	without caries	651	32.55	58.28
	missing	883	44.15	
Endodontic treatment	successful	105	5.25	9.40
	too short filling	121	6.05	10.83
	overfilled	11	0.55	0.98
	without treatment	880	44.00	78.78
	missing	883	44.15	
Periapical lesion	endodontic treatement	116	5.80	10.38
	no endod.treatment	71	3.55	6.36
	without lesion	930	46.50	83.26
	missing	883	44.15	
Protruding restoration	Stand	417	20.85	37.33
	not rest	700	35.00	62.67
	missing	883	44.15	
Furcation involvement	involved furcation	482	24.10	43.15
	no damage	635	31.70	56.85
	missing	883	44.15	
Resorption of alveolar bone	<1 mm	195	9.75	17.46
	1–3 mm	560	28.00	50.13
	3–6 mm	333	16.65	29.81
	>6 mm	29	1.45	2.60
	missing	883	44.15	

TABLE 5
SHOWING THE DISTRIBUTION AND FREQUENCY OF THE EXAMINED VARIABLES ON SECOND MOLARS (THE PRESENCE OF SECOND MOLARS, DENTAL CARIES, ENDODONTIC TREATMENT, APICAL LESION, PROTRUDING RESTORATION, DAMAGE BIFURCATION, ALVEOLAR BONE RESORPTION

		Number of teeth	% In total	% Present
Missing	yes	416	20.80	
	no	1584	79.20	
Caries	crown	330	16.50	20.83
	root	98	4.90	6.19
	crown and root	41	2.05	2.59
	no	1115	55.75	70.39
	missing	416	20.80	
Endodontical treatment	successful	86	4.30	5.43
	too short filling	80	4.00	5.05
	overfilled	13	0.65	0.82
	no treatment	1405	70.25	88.70
	missing	416	20.80	
Periapical lesion	endodontic treatment	83	4.15	5.24
	Without endod.treatment	95	4.75	6.00
	without lesion	1406	70.30	88.76
	missing	416	20.80	
Inadequate filling	Stand	358	17.90	22.60
	not rest	1226	61.30	77.40
	missing	416	20.80	
Furcation involvement	involved furcation	530	26.50	33.46
	without damage	1054	52.70	66.54
	missing	416	20.80	
Resorption of alveolar bone	<1 mm	233	11.65	14.71
	1–3 mm	803	40.15	50.69
	3–6 mm	503	25.15	31.76
	>6 mm	45	2.25	2.84
	missing	416	20.80	

The distribution of observed variables in third molars is shown in Table 6.

OPG analysis determined the lack of a total of 949 (47.45%) third molars, and also found the embryos of 127 third molars (6.35%). Crown caries appeared on the present third molars of 192 (20.78%) teeth. Only 22 (2.38%) had an acceptable endodontic treatment, while 15 (1.62%) third molars had unacceptable root- fillings. Fifty-five (5.95%) third molars had apical lesion, while 95 (10,28%) of them had inadequate restorations. Furcation involvement was found in 160 (17.32%) cases. Alveolar bone resorption was 1–3 mm (49.68%) in the majority of the remaining third molars.

Discussion

The purpose of this study was to determine the prevalence of third molars in terms of respondents' age. Furthermore, it was desired to determine the extent of the manifestation of pathological changes, such as caries, apical lesions, and alveolar bone resorption, as well as to provide a detailed analysis of the percentage prevalence of third molars compared with percentage incidence of first and second molars and pathological conditions on them.

This study was based on 500 OPGs of patients from the Faculty of Dentistry, University of Zagreb. Patients were divided into seven age groups. The total number of molars, the number of cavities on remaining molars provided that the decay is divided into crown and root caries followed by the quality of endodontic treatment on these teeth and the evaluation of their performance and presence of periapical lesions was analyzed. As a part of the periodontal status, the number of inadequate fillings, the number of damaged furcations and bone resorption was analyzed. In terms of age groups, 8.4% of OPGs belonged to the first age group, 21.2% to the second, 20.2% to the third, 22.6% to the fourth, 17.8% to the fifth, 7.8% to the sixth and only 2% to the seventh group. In terms of gen-

TABLE 6
SHOWING THE DISTRIBUTION AND FREQUENCY OF THE EXAMINED VARIABLES ON THIRD MOLARS (THE PRESENCE OF THIRD MOLARS, DENTAL CARIES, ENDODONTIC TREATMENT, APICAL LESION, PROTRUDING RESTORATION, DAMAGE BIFURCATION, ALVEOLAR BONE RESORPTION)

		Number of teth	% In total	% present
Missing	yes	949	47.45	
	no	924	46.20	
	bud	127	6.35	
Caries	crown	192	9.60	20.78
	root	41	2.05	4.44
	crown and root	21	1.05	2.27
	no	670	33.50	72.51
	missing	1076	53.80	
Endodontic treatment	successful	22	1.10	2.38
	too short filling	15	0.75	1.62
	overfilled	1	0.05	0.11
	no treatment	886	44.30	95.89
	missing	1076	53.80	
Periapical lesion	endodontic treatment	11	0.55	1.19
	no endod.treatment	44	2.20	4.76
	no	869	43.45	94.05
	missing	1076	53.80	
Inadequate filling	stand	95	4.75	10.28
	not rest	829	41.45	89.72
	missing	1076	53.80	
Furcation involvement	damaged furcation	160	8.00	17.32
	no damage	764	38.20	82.68
	missing	1076	53.80	
Alveolar bone resorption	<1 mm	235	11.75	25.43
	1–3 mm	459	22.95	49.68
	3–6 mm	220	11.00	23.81
	>6 mm	10	0.50	1.08
	missing	1076	5.80	

der, 267 (53%) out of 500 examined OPGs belonged to females, and 233 (47%) to men. As far as the total number of remaining molars is concerned, our research has shown that on average there were two remaining first and third molars per person, and four second molars. In a total of 500 examined OPGs, 924 third molars and 127 buds of third molars were found. Since OPGs belonged to different age groups, the distribution of variables differed with respect to age, as expected. The average number of first and second molars decreased with age, while the average number of third molars was higher in the second than in the first age group.The number of first, second and third molars significantly decreased in higher age groups. Since first molars sprout first, as early as at the age of six, we slowly lose them with age and found in a smaller percentage than second molars. As to the number of third molars, they were found to be significantly less represented in the first age group than in the second, with their number further decreasing in older age groups. This is confirmed by various studies which indicate that the time of eruption of third molars varies, and it has been proved that they appear most frequently between the age of 16 and 24. However, it is also well-known that third molars can appear at either earlier and later stages of life, while in some people they may never appear. Likewise, in each man we can find only one, two or three third molars, while the others are missing[1,14–17]

Other analyzed data referred to caries on first, second and third molars. Literature offers numerous studies[18–21] on the reliability of X-ray findings in the diagnosis of carious lesions. Most authors agree that the X-ray beam are a useful indicators in carious lesions diagnosis and their findings are more accurate when carious lesions are located deeper in the dentin. Shugars et al.[22,23] suggest that discovering decayed molars is a continuous lesion, and that clinicians should expect the accumulation of dental plaque on tooth surfaces, and the eventual devel-

opment of dental caries over time, depending on the position of third molars in the jaw and the anatomy of their occlusal surfaces, which are often deep and with multiple occlusal fissures. The same authors believe that, since the decay is considered an infectious disease, if it is not found on first and second molars, it is unlikely to be detected on third molars either. Moreover, the presence of caries on first and second molars, according to them, does not imply the manifestation of caries on third molars. However, the presence of dental caries in some mouths indicates the presence of cariogenic bacteria and their destructive effects, and it is a possible predictor of new caries incidence on other teeth. In this study, caries was detected on the crown, on the root, or both on the crown and root. On the remaining first molars, the crown caries was found in 31.69% of cases, the root caries in 6,89%, while both crown and root caries was found in only 3.13% of cases. On the remaining second molars, the crown caries was found in 20,83% of cases, the root caries in 6.19% and the crown and root caries in 2.59% cases. As for caries in third molars, the crown caries was found in 20.78% of cases, the root caries in 4.44%, and the crown and root caries in 2.27% of cases. The results coincide with the results of Shugars et al.[22] who quote generally lower prevalence of caries in third molars as compared to first and second molars, both at the beginning of the study and after 2.9 years of the follow-up period.

The analysis of endodontic treatment in this study has shown that only 105 (9.4%) of first molars had a successful endodontic treatment, while 121 (10.83%) of them were underfilled, and 11 (0.98%) of them were overfilled. In case of second molars, there were 86 (5.43%) teeth with a successful endodontic treatment, 80 (5,05%) of them were underfilled, and 13 (0.82%) of them were overfilled. Third molars had the lowest number of endodontic treatments. Successful were only 22 (2.38%) treatments, 15 (1.62%) of them were underfilled, and only one (0.11%) out of 924 remaining third molars was overfilled. Our research has shown that third molars are teeth that are treated the least. The criterion by which the success of endodontic treatments was determined was the distance from the end of filling to the radiographic apex. If the distance was more than 2 mm the therapy was considered unsuccessfull[24,25].

A number of European authors have concerned themselves with the same problem. Weiger et al.[26] have analyzed the endodontic treatment of teeth among the urban German population. According to the criteria of length and consistency of endodontic filling, the authors estimate that in 7,897 teeth samples, only 14% of teeth were successfully treated. Dougas et al.[27] have analyzed the condition of endodontically treated teeth in two cities in Canada, Toronto and Saskatoon. In Toronto, 44% of endodontically treated teeth had periapical lesions, while in Saskatoon the percentage was even higher, and it amounted to 51%. Jimenez-Pinzón et al.[28] and Georgopoulou et al.[29] having analysed patients in Spain and Greece, suggest that molars and premolars are endodontically treated more often than front teeth.

The analysis of periapical lesions in our study has revealed that, in terms of first molars, 116 (10.38%) periapical lesions appeared in endodontically treated teeth, while in endodontically untreated teeth their number was 71 (6.36%). In terms of second molars, we found 83 (5.24%) endodontically treated and 95 (6%) non-endodontically treated teeth with periapical lesion. As regards the total number of remaining third molars, there were 11 (1.19%) endodontically treated teeth with periapical lesion and 44 (4.76%) teeth with periapical lesion that were not endodontically treated.

In addition to that, the quality of restorations on molars was analyzed. Regarding inadequate restorations, they were found in 37.33% of cases in first molars, in 22.6% of cases in second molars, and only in 10.28% of cases in third molars. Hommez et al.[31]have analyzed the relationship between the quality of dental restorations, the quality of the endodontic filling and the status of periapical area. It was proved that the quality of dental restorations was statistically significant for teeth with apical periodontitis; in 23.8% of cases, apical periodontitis was present with satisfactory restorations, and in 49.1% with poor fillings. Siqueira et al.[32] find that endodontically treated teeth are successfully cured in 71% when they have satisfactory root canal fillings and crown restorations, and in 65% in case of inadequate dental restorations.

Assessment of involved furcations showed that the lowest percentage of 8% was found in third molars, while first and second molars had approximately the same percentage of damaged furcations (24.1% on first molars, and 26, 5% on second molars).

The last analysis concerned bone resorption in all remaining molars. The majority of all remaining molars had bone resorption of 1–3 mm. The highest percentage of bone resorption, which ranged berween 3–6 mm, was found in second molars (31.76%), while the rate of resorption in first and third molars was 29.81% and 23.81% respectively. Bone resorption of over 6 mm and less than 1 mm was found in a very small percentage of all molars.

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POJAVNOST TREĆIH MOLARA I PATOLOŠKE PROMJENE VEZANE ZA NJIH U DENTALNOJ MEDICINI

S A Ž E T A K

Svrha ovog rada bila je utvrditi pojavnost trećih molara u odnosu na dob ispitanika. Nadalje, željeli smo utvrditi opseg manifestacije patoloških promjena kao što su karijes, apikalne lezije, zahvaćenosti furkacija i resorpcija alveolarne kosti. Ova studija se temelji na 500 ortopantomograma pacijenata sa Stomatološkog fakulteta Sveučilišta u Zagrebu. Pacijenti su podijeljeni u sedam dobnih skupina. Analiziran je ukupan broj molara, broj karijesa na preostalim molarima, kvaliteta endodontskih tretmana i procjenjivala njihova uspješnost te prisutnost periapikalnih lezija. U sklopu određivanja parodontološkog statusa analiziran je broj prevjesećih ispuna, broj oštećenih furkacija i resorpcije alveolarne kosti. Statistička analiza provedena je pomoću statističkog paketa STATISTICA 7 (StatSoft, Tulsa, SAD). Korelacija između ukupnog broja molara i dobi pacijenta analizirana je pomoću Spearmanove korelacije s razinom značajnosti od 0,05. Broj prvih, drugih i trećih molara značajno je smanjen u starijim dobnim skupinama. Pojavnost karijesa kod treći molara u odnosu na prve i druge molare bila je općenito manja dok su treći molari najmanje endodontski tretirani. Procjena oštećenih furkacija pokazala je najniži postotak od 8% kod trećih molara. Kod većine svih preostalih molara resorpcija kosti bila je od 1–3 mm.